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EXAMINER	
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1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/813,409	CHEN, GA-LANE	
	Examiner	Art Unit	
	Michael Band	1795	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 November 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/25/2007*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-3, 5, 7, 9, 11, and 15-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Beck et al (US Patent No. 6,518,086).

With respect to claims 1 and 15, Beck et al discloses a method of producing thin-films of group IB-IIIA-VIA on a substrate in a vacuum for use in photovoltaic applications (i.e. electrically conductive) (abstract). Beck et al further discloses a preferred method of DC magnetron sputtering incorporating specially designed shields and sputter guns to prevent group VIA (e.g., Se) poisoning of the group IB (e.g., Cu) and group IIIA (e.g., Ga, In, or In-Ga) targets in the sputtering apparatus (col. 7, lines 15-25), thus a plurality of target modules are used in the sputtering apparatus. It is well known that Se, Cu, Ga, and In have electrical properties and are thus electrically conductive. Beck et al also discusses using argon in the sputtering process (col. 8, lines 25-33). It is also inherent that a DC sputtering magnetron has a voltage applied to a target (i.e. cathode) as evidenced by Love et al (US Patent No. 4,465,575; col. 17, line 37) which is referenced by Beck et al (col. 7, lines 15-17). Beck et al further discloses coating a substrate by sequential deposition of a group IIIA-VIA followed by deposition of a group IB-VIA by

sputtering (col. 7, lines 6-13), thus a plurality of electrically conductive layers are formed on the substrate from multiple targets. In addition, Beck et al discusses a precursor layer [38] comprising one layer [34] or two or more (i.e. three) sequentially deposited layers [34] and [36], with it being preferable that precursor [38] comprise between 1-3 layers (col. 6, lines 27-35). The layers [34], [36] may have various combinations of IB-VIA (e.g. Cu-Se), and/or IIIA-VIA (e.g., Ga -Se), and/or (e.g., Cu-Ga -Se) (col. 6, lines 53-57), thus the layers are metallic.

With respect to claims 2 and 16, Beck et al further discloses that the vacuum is 10^{-7} Torr to 10^{-5} Torr (col. 10, lines 1-5).

With respect to claims 3 and 17, Beck et al further discloses using a sputter pressure of 10 mTorr (10^{-2} Torr) argon (col. 15, lines 39-41).

With respect to claim 5, Beck et al further discloses a DC magnetron sputtering is used to sputter the targets (col. 7, lines 15-24), thus a DC (i.e. direct current) power source is used.

With respect to claim 7, Beck et al further discloses electrically conductive layers composed of copper, indium, and gallium (col. 7, lines 25-37).

With respect to claim 9, Beck et al further discloses a target made from copper (col. 7, lines 18-30).

With respect to claim 11, Beck et al further discloses a composite target composed of Ga-In (col. 7, lines 20-24) or Cu-Ga (col. 15, lines 29-30).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 4 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beck et al (US Patent No. 6,518,086) as applied to claims 1 and 15 above, and further in view of Heeks et al (US Patent No. 6,559,593).

With respect to claims 4 and 18, the reference is cited as discussed for claims 1 and 15. However Beck et al is limited in that while it discusses an inert (i.e. argon) gas being injected into the apparatus, a specific flow rate is not suggested.

Heeks et al teaches a method of sputter deposition onto an organic material (i.e. substrate resin) using a discharge gas (abstract), with the discharge gas being either

argon or neon (col. 2, lines 31-35). Heeks et al further teaches that the target could comprise a metal or metal alloy, with the metals being copper (Cu) or indium (In) (col. 3, lines 2-10). Heeks et al describes a sputtering apparatus using DC magnetron sputtering where the discharge gas, either argon or neon, has a flow rate of 25 sccm (col. 5, lines 25-35 and line 60).

It would have been obvious to one of ordinary skill in the art to apply the known technique of using an inert, working gas (i.e. argon) at a specific flow rate to sputter a substrate taught in Heeks et al to improve the sputtering magnetron apparatus of Beck et al for the predictable result of a specific concentration of generated plasma and metal ions sputtered onto a substrate.

6. Claims 6 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beck et al (US Patent No. 6,518,086) as applied to claims 1 and 15 above, and further in view of Wickersham, Jr. et al (US Patent No. 7,087,142).

With respect to claims 6 and 19, the reference is cited as discussed for claims 1 and 15. However Beck et al is limited in that while it is inherent to bias the target and therefore have a power density present, neither a specific target voltage nor power density is suggested.

Wickersham et al teaches generating an argon plasma magnetically contained via DC magnetron (col. 5, lines 40-50) with a target composed of a Cu-Al alloy (col. 3, lines 58-63) for sputtering onto a substrate. Wickersham et al further teaches a power density range from 8 W/cm^2 to 60 W/cm^2 using this DC magnetron sputtering apparatus (col. 5, lines 40-47). Furthermore, Wickersham et al describes in Table 1 the sputtering

voltage and power densities used in the apparatus, where the voltages are between 405 volts and 503 volts with accompanying power densities (Table 1, col. 5-6).

It would have been obvious to one of ordinary skill in the art to try the ranges of voltages and power densities of Wickersham et al in an attempt to provide an improved power source for the apparatus of Beck et al as a person with ordinary skill has good reason to pursue the known options within his or her technical grasp.

It has been held that in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

7. Claims 8, 10, and 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beck et al (US Patent No. 6,518,086) as applied to claims 1, 7, and 11 above, and further in view of Kobayashi (Japanese Patent No. 63270452).

With respect to claims 8 and 10, the reference is cited as discussed for claim 7. However Beck et al is limited in that while a variety of different metals are suggested for deposition, nickel or stainless steel is not.

Kobayashi teaches PVD (physical vapor deposition) magnetron sputtering a thin film onto a polymer substrate by generating a plasma near a metal target (abstract). Furthermore, Kobayashi discusses using a variety of metals incorporated as targets, including aluminum (Al), copper (Cu), titanium (Ti), indium (In), tellurium (Te), selenium (Se), nickel (Ni), chromium (Cr), and iron (Fe) (abstract). Also discussed as possible target materials are metallic or semimetallic compounds (abstract). It is well known that

stainless steel is comprised of iron and chromium (i.e. metallic compound). Kobayashi cites the advantage of using these materials as superior adhesion of film layers to the substrate in addition to reduction in mechanical stresses due to differences of thermal expansivity between the substrate and metal (abstract).

It would have been obvious to one of ordinary skill in the art to incorporate the metals and metallic compounds taught in Kobayashi as the target materials in Beck et al in order to gain the advantages of superior adhesion of films to the substrate and reduction in mechanical stress.

With respect to claim 12, the references are cited as discussed for claim 11. However Beck et al is limited in that while copper and other electrically conductive materials are used as distinct target components, nickel and stainless steel are not specified.

Kobayashi teaches PVD (physical vapor deposition) magnetron sputtering a thin film onto a polymer substrate by generating a plasma near a metal target (abstract). Furthermore, Kobayashi discusses using a variety of metals incorporated as targets, including aluminum (Al), copper (Cu), titanium (Ti), indium (In), tellurium (Te), selenium (Se), nickel (Ni), chromium (Cr), and iron (Fe) (abstract). Also discussed as possible target materials are metallic or semimetallic compounds (abstract). It is well known that stainless steel is comprised of iron and chromium (i.e. metallic compound). Kobayashi cites the advantage of using these materials as superior adhesion of film layers to the substrate in addition to reduction in mechanical stresses due to differences of thermal expansivity between the substrate and metal (abstract).

It would have been obvious to one of ordinary skill in the art to incorporate the metals and metallic compounds taught in Kobayashi as the target materials in Beck et al in order to gain the advantages of superior adhesion of films to the substrate and reduction in mechanical stress.

With respect to claims 13 and 14, the reference is cited as discussed for claim 11. Beck et al further discloses how the substrate should be of sufficient thickness to provide mechanical support to the film (col. 6, lines 11-15). Beck et al also states suitable substrates are glass, stainless steel, metal foils, high temperature plastics, ceramic, and silicon (col. 6, lines 14-19). However Beck is limited in that while it is discussed to use high temperature plastics, it is not suggested that the substrate be a resin nor specified the composition of the substrate.

Kobayashi teaches Kobayashi teaches PVD (physical vapor deposition) magnetron sputtering a thin film onto a polymer substrate by generating a plasma near a metal target (abstract). In addition, Kobayashi states that the substrate is a polycarbonate resin or epoxy resin (abstract), both of which are known thermoplastics (i.e. high temperature plastics). Polycarbonate is a similar in nature to a glycol-modified polyester which is a liquid crystal polymer and encompasses polyethylene terephthalate, as evidenced by www.wikipedia.com (Documents U and V of PTO-892, filed 7-31-2007). Kobayashi cites the advantage of using these materials as superior adhesion of film layers to the substrate in addition to reduction in mechanical stresses due to differences of thermal expansivity between the substrate and metal (abstract).

It would have been obvious to one of ordinary skill in the art to use a polycarbonate resin taught in Kobayashi as the substrate material in Beck et al in order to gain the advantages of superior adhesion of films to the substrate and reduction in mechanical stress.

Response to Arguments

112 Rejections

8. With respect to the 112 rejections, Applicant has provided support for the claimed voltage and power density ranges. Therefore the rejections are withdrawn.

102 and 103 Rejections

9. Applicant's arguments filed November 8, 2007 have been fully considered but they are not persuasive.

10. On pages 6-10, the Applicant arguments are directed to claims 1 and 15 and all dependants of said claims that three distinct metal layers are not sequentially deposited onto a substrate.

The Examiner respectfully disagrees. Beck et al depicts in fig. 1, a precursor layer [38] comprising between 1-3 layers (col. 6, lines 27-35), where the layers are composed of metals (col. 5, lines 24-31). While the layer also comprises a nonmetal, a metal component still forms each layer.

Conclusion

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Band whose telephone number is (571) 272-9815. The examiner can normally be reached on Mon-Fri, 8am-4pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

13. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MAB

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Alexa Neckel

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SUPERVISORY PATENT EXAMINER